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MICROWAVE TUBE ANTENNA ENABLING WORK IN THREE FREQUENCY BANDS, (U)
NOV 76 J DOBOSZ, E PIETRASZEWSKI, W SLOWIECKI
FTD-ID(RS)I-1393-76

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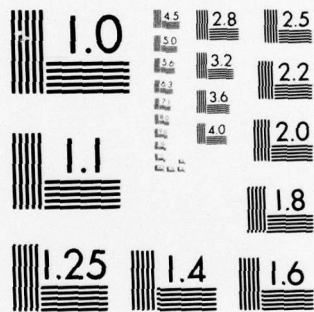
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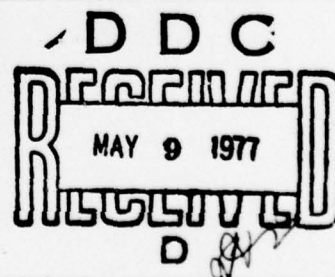
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by

J. Dobosz, E. Pietraszewski, W. Slowiecki



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EDITED TRANSLATION

FTD-ID(RS)I-1393-76

8 November 1976

FTD-76-C-001144

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FREQUENCY BANDS

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English pages: 4

Source: III Krajowa Konferencja Meas Zakopane
30 Sept- 3 Oct 1974, Mikrofalowa Elektronika
Ciala Stalego, Warsaw, 1974, PP 18-21

Country of origin: POLAND

Translated by: SCITRAN

F33657-76-D-0390

Requester: FTD/ETWE

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ID(RS)I-1393-76

Date 8 Nov 19 76

^{TUBE}
MICROWAVE ~~ON~~ ANTENNA ENABLING WORK IN THREE FREQUENCY BANDS by Jerzy Dobosz,
Edward Pietraszewski and Wadim Slowiecki

1. Introduction

Wide-band antennae are currently known from the technological literature. /18
In practice assurance of ^{cy}parameters constant in a wide band of frequency
is not always necessary and an antenna with sufficiently good ²parameters in
only certain bands of work of microwave apparatus is sufficient.

2. Antenna construction /1/

A tube antenna, designed for one band of basic frequency, can be used
to work in two other bands, comprising the second and third harmonic of
basic frequency, after some structural changes.

In connection with the above we have limited ourselves to investigating
three electrical waves in a wave-guide with the break-down presented in Fig. 1.b.
For the purpose of approximate assurance of a steady phase at the ^{aperture}~~aperture~~
for the third harmonic, which corresponds to the break-down of a wave of type
 TE_{30} , it is sufficient to extend the tube so that the differences in the
electric routes ee'-cc' and ff'-cc' for the harmonic amount to 180° (Fig. 1a).
A similar method can guarantee phase stability for the second harmonic /2/,
^b but in the antenna under discussion we used a dielectric for this purpose
acting partially as a wave-guide, which causes distortion of the wave front
/3/. In order for the dielectric

to have an effect, it is primarily directed at the wave of field break-down TE_{20} , and must determine a thin plate placed at the spot where the magnitude of the electrical field of the third harmonic of break-down TE_{30} , amounts to zero, ~~E_z~~ , at a distance one-third away from the wezsca wall of the wave-guide (Fig. 1a). Obtaining the required distortion of the wave head of the second harmonic, which in effect allows the required phase stability to be obtained, imposes conditions for the magnitude of shift of the phase introduced by the dielectric plate and on its distance from the base of the tubes. Thorough consideration has shown that the phase shift should be about 190° , and the dielectric plate placed at the base of the tube.

3. Results of measurements

~~The~~ ^{we} designed and produced ^a tube antenna, working in the bands 10cm, 4.5cm and 3cm. The transverse dimensions of the wave-guide were taken as $a=72\text{mm}$, $b=10\text{mm}$, tube length $L=90\text{mm}$, ^{and} tube width $D=130\text{mm}$. The radiation characteristics are presented in Fig. 2. The results obtained show ^{the suitability of the tube antenna} described for multiband use, particularly as an element illuminating a parabolic antenna.

Literature

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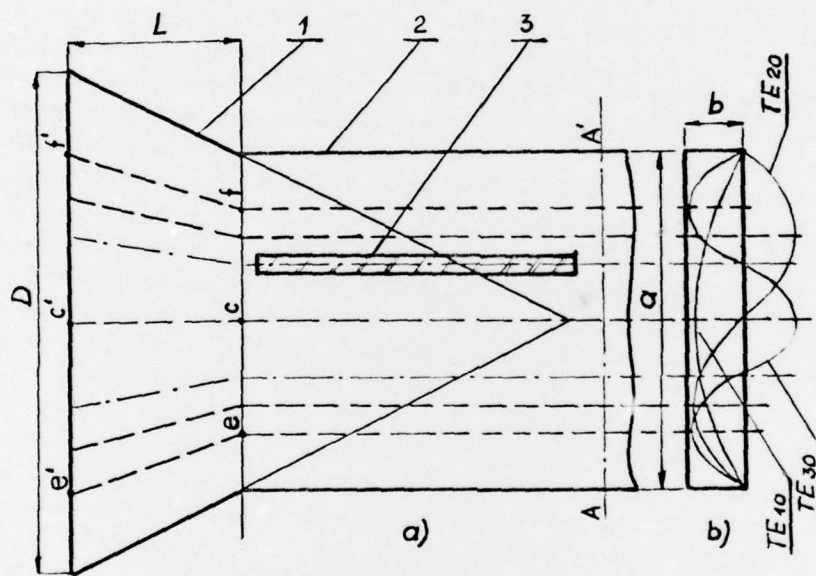


Fig. 1a. Construction of a three-band tube antenna: 1-tube, 2-wave-guide, 3-phase shifter; b(break-down of the tension of the electrical field at level AA')

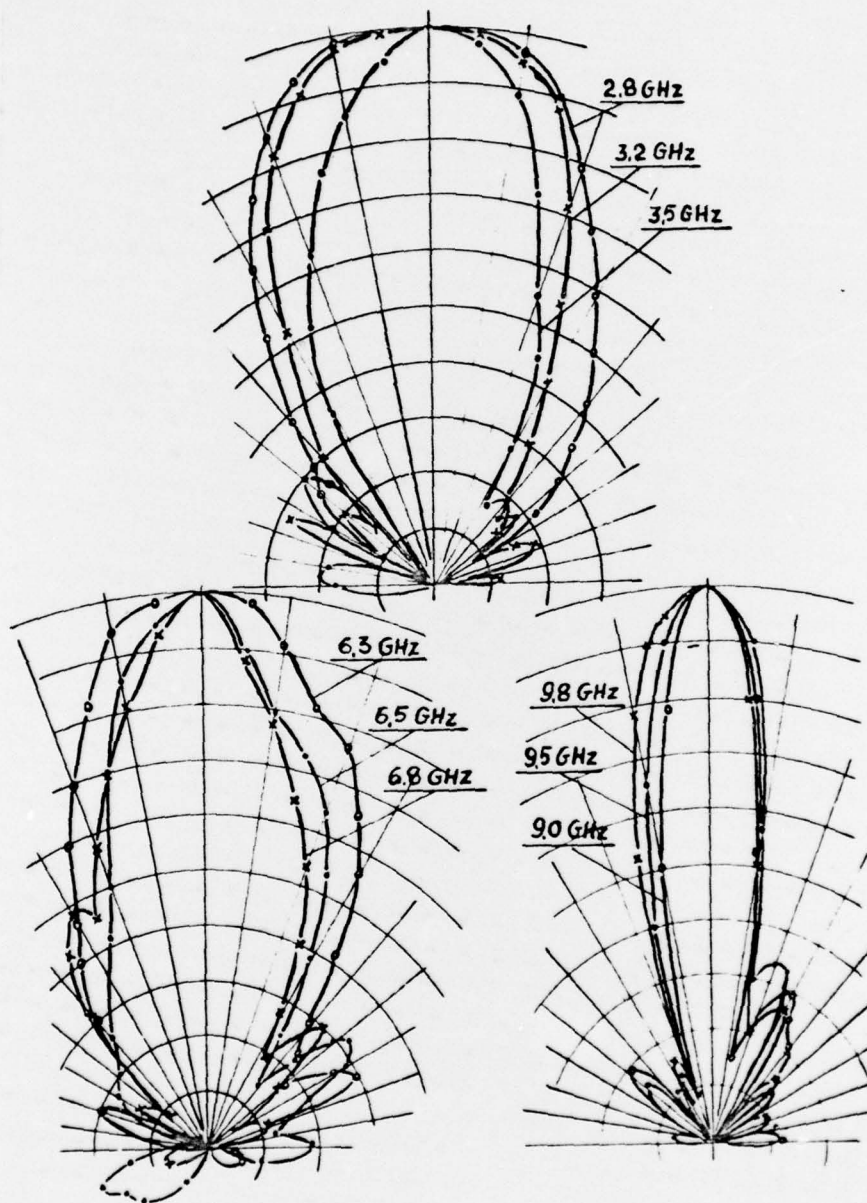


Fig. 2. Characteristics of antenna radiation

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
FTD-ID(RS)I-1393-76		
4. TITLE (and Subtitle) MICROWAVE TUBE ANTENNA ENABLING WORK IN THREE FREQUENCY BANDS		5. TYPE OF REPORT & PERIOD COVERED Translation
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) J. Dobosz, E. Pietraszewski, W. Slowiecki		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Foreign Technology Division Air Force Systems Command U. S. Air Force		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE 1974
		13. NUMBER OF PAGES 4
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
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